

Claims

1. An autostereoscopic display apparatus comprising:
a spatial light modulator comprising an array of pixels arranged in rows and
5 columns in a pixel plane, the pixels comprising pixel apertures having gaps
therebetween with the gaps between the columns of pixels extending substantially
parallel to the columns of pixels; and
a spatially multiplexing parallax element capable of directing light from
successive columns of pixels towards successive ones of two or more viewing windows
10 in a nominal window plane,
wherein the pixel apertures are arranged so that across two adjacent columns the
convolution in a direction perpendicular to the columns of:
(a) the intensity profile of an image of a nominal human pupil in the nominal
window plane formed in the pixel plane by the spatially multiplexing parallax element,
15 and
(b) the total height of the pixel apertures parallel to the columns of pixels
varies by at most 5% of the maximum of the convolution.
2. A display apparatus according to claim 1, wherein the pixel apertures repeat at
20 a pitch substantially equal to a representative width of said intensity profile.
3. A display apparatus according to claim 2, wherein the pixel apertures of pixels
of each colour have substantially the same, constant total height parallel to the columns
of pixels.
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4. A display apparatus according to claim 3, wherein the pixel apertures of pixels
of different colours have substantially the same total height parallel to the columns of
pixels.

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5. A display apparatus according to any one of claims 2 to 4, wherein the pixel apertures of pixels of each colour have substantially the same width perpendicular to the columns.
- 5 6. A display apparatus according to claim 5, wherein the pixel apertures of pixels of different colours have substantially the same width.
7. A display apparatus according to claim 5, wherein the pixel apertures of pixels of different colours have different widths to compensate for chromatic aberration.
- 10 8. A display apparatus according to any one of claims 2 to 7, wherein along the rows of pixels, the pixels are arranged in groups consisting of a plurality of adjacent pixels of the same colour.
- 15 9. A display apparatus according to claim 8, wherein the pixels of each group are commonly addressable.
10. A display apparatus according to any one of claims 2 to 9, wherein said representative width is the width between the 5% and 95% cumulative integration points
20 of said intensity profile.
11. A display apparatus according to claim 1, wherein the total height of the pixel apertures parallel to the columns of pixels varies.
- 25 12. A display apparatus according to claim 11, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which increases towards the edges of the pixel apertures relative to the centre of the pixel apertures.
13. A display apparatus according to claim 12, wherein the total height of the pixel
30 apertures parallel to the columns of pixels has a profile which has a flat central portion.

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14. A display apparatus according to any one of claims 11 to 13, wherein a representative width of said intensity profile is at most 75% of the pitch of the columns.
15. A display apparatus according to claim 14, wherein said representative width is
5 the width between the 5% and 95% cumulative integration points of said intensity profile.
16. An autostereoscopic display apparatus comprising:
a spatial light modulator comprising an array of pixels arranged in rows and
10 columns in a pixel plane, the pixels comprising pixel apertures having gaps therebetween with the gaps between the columns of pixels extending substantially parallel to the columns of pixels; and
a spatially multiplexing parallax element capable of directing light from successive columns of pixels towards successive ones of two or more viewing windows
15 in a nominal window plane,
wherein the pixel apertures repeat at a pitch equal to a representative width of the intensity profile of an image of a nominal human pupil in the nominal window plane formed in the pixel plane by the spatially multiplexing parallax element.
- 20 17. A display apparatus according to claim 16, wherein the pixel apertures of pixels of each colour have substantially the same, constant total height parallel to the columns of pixels.
18. A display apparatus according to claim 17, wherein the pixel apertures of pixels
25 of different colours have substantially the same total height parallel to the columns of pixels.
19. A display apparatus according to any one of claims 16 to 18, wherein the pixel apertures of pixels of each colour have substantially the same width perpendicular to the
30 columns.

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20. A display apparatus according to claim 19, wherein the pixel apertures of pixels of different colours have substantially the same width.

21. A display apparatus according to claim 19, wherein the pixel apertures of pixels
5 of different colours have different widths to compensate for chromatic aberration.

22. A display apparatus according to any one of claims 16 to 21, wherein along the rows of pixels, the pixels are arranged in groups consisting of a plurality of adjacent pixels of the same colour.

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23. A display apparatus according to claim 22, wherein the pixels of each group are commonly addressable.

24. A display apparatus according to any one of claims 16 to 23, wherein said
15 representative width is the width between the 5% and 95% cumulative integration points of said intensity profile.

25. An autostereoscopic display apparatus comprising:
a spatial light modulator comprising an array of pixels arranged in rows and
20 columns in a pixel plane, the pixels comprising pixel apertures having gaps therebetween with the gaps between the columns of pixels extending substantially parallel to the columns of pixels; and
a spatially multiplexing parallax element capable of directing light from successive columns of pixels towards successive ones of two or more viewing windows
25 in a nominal window plane,
wherein the total height of the pixel apertures parallel to the columns of pixels varies.

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26. A display apparatus according to claim 25, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which increases towards the edges of the pixel apertures relative to the centre of the pixel apertures.
- 5 27. A display apparatus according to claim 26, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which has a flat central portion.
28. A display apparatus according to any one of claims 25 to 27, wherein a
10 nominal window plane formed in the pixel plane by the spatially multiplexing parallax element is at most 75% of the pitch of the columns.
29. A display apparatus according to claim 28, wherein said representative width is
15 the width between the 5% and 95% cumulative integration points of said intensity profile.
30. A display apparatus according to any one of the preceding claims, wherein the rows and columns are perpendicular to each other.
- 20 31. A display apparatus according to any one of the preceding claims, wherein the display apparatus is switchable between a first mode in which the spatially multiplexing parallax element is effective to direct light from successive columns of pixels towards an alternate one of two viewing windows and a second mode in which the spatially multiplexing parallax element has no effect.
- 25 32. A display apparatus according to any one of the preceding claims, wherein the spatially multiplexing parallax element has a structure which is uniform in a direction parallel to the columns of pixels and which repeats in a direction parallel to the rows of pixels.

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33. A display apparatus according to any one of the preceding claims, wherein the spatially multiplexing parallax element is a lenticular array.
34. A display apparatus according to any one of the preceding claims, wherein the
5 spatially multiplexing parallax element has a structure which repeats at a pitch which is substantially an integer multiple of the pitch of the columns of the array of pixels.
35. A display apparatus according to any one of the preceding claims, wherein the pitch of the windows in the nominal viewing plane is less than 55mm.